

**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**LISTING OF CLAIMS:**

1. **(previously presented)** A nematic liquid crystal display device presenting two stable states, without an electric field, that are obtained by anchoring break, the two stable states corresponding to two textures of liquid crystal molecules, the twisting of which differs by  $150^\circ$  to  $180^\circ$  in absolute values, wherein said nematic liquid crystal device comprises two polarizers (10, 40), the first polarizer (10) being placed on the side of the observer, the other polarizer (40) being placed on the opposite face of the liquid crystal cell, the orientation of the two polarizers being shifted by a value equal to the rotatory power of the cell  $\pm \pi/2$ , the rotatory power corresponding to the effect of the most twisted texture.

2. **(previously presented)** The device according to claim 1, wherein the optical delay  $\Delta n d$  is of the order of  $240 \pm 80$  nm.

3. **(previously presented)** The device according to claim 1, wherein orientation of the polarizer placed on the

opposite side with respect to the observer, as referring to the nematic director on the associated face of the cell, is comprised within the range containing the sub-range  $\pm 20^\circ$  to  $70^\circ$ , whilst the orientation of the polarizer placed on the side of the observer, as referring to the same nematic director reference, is comprised within the range comprising the sub-range from  $\pm 20^\circ$  to  $70^\circ$ .

**4. (previously presented)** The device according to claim 1, wherein, for a levo-rotatory liquid crystal, the orientation of the polarizer placed on the opposite side with respect to the observer is comprised within the range comprising the sub-ranges  $-70^\circ$  to  $-40^\circ$  and  $20^\circ$  to  $55^\circ$ , whilst the orientation of the polarizer placed on the side of the observer is comprised within the range comprising the sub-ranges  $-55^\circ$  to  $-20^\circ$  and  $35^\circ$  to  $70^\circ$ , and for a dextro-rotatory liquid crystal, the orientation of the polarizer placed on the opposite side with respect to the observer is comprised within the range comprising the sub-ranges  $-55^\circ$  to  $-20^\circ$  and  $40^\circ$  to  $70^\circ$ , whilst the orientation of the polarizer placed on the side of the observer is comprised within the range comprising the sub-ranges  $-70^\circ$  to  $-35^\circ$  and  $20^\circ$  to  $55^\circ$ .

**5. (previously presented)** The device according to claim 1, wherein the twist angle of the molecules in one of the two stable states is comprised between  $0^{\circ}$  and  $15^{\circ}$ .

**6. (previously presented)** The device according to claim 1, wherein the twist angle of the molecules in one of the two stable states is comprised between  $0^{\circ}$  and  $15^{\circ}$ , the optical delay  $\Delta n d = 200 \pm 40$  nm, and for a levo-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-60^{\circ}; -40^{\circ}] \cup [30^{\circ}; 50^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-50^{\circ}; -25^{\circ}] \cup [40^{\circ}; 70^{\circ}]$ .

**7. (previously presented)** The device according to claim 1, wherein the twist angle of the molecules in one of the two stable states is comprised between  $0^{\circ}$  and  $15^{\circ}$ , the optical delay  $\Delta n d = 200 \pm 40$  nm, and for a dextro-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-50^{\circ}; -30^{\circ}] \cup [40^{\circ}; 60^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-70^{\circ}; -40^{\circ}] \cup [25^{\circ}; 50^{\circ}]$ .

**8. (cancelled)**

**9. (previously presented)** The device according to claim 1, wherein the twist angle of the molecules in one of the two stable states is comprised between  $0^{\circ}$  and  $15^{\circ}$ , the optical delay  $\Delta n d = 280 \pm 40$  nm, and for a levo-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-65^{\circ}; -45^{\circ}] \cup [25^{\circ}; 50^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-50^{\circ}; -20^{\circ}] \cup [40^{\circ}; 70^{\circ}]$ .

**9 10. (currently amended)** The device according to claim 1, wherein the twist angle of the molecules in one of the two stable states is comprised between  $0^{\circ}$  and  $15^{\circ}$ , the optical delay  $\Delta n d = 280 \pm 40$  nm, and for a dextro-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-50^{\circ}; -25^{\circ}] \cup [45^{\circ}; 65^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-70^{\circ}; -40^{\circ}] \cup [20^{\circ}; 50^{\circ}]$ .

**11. (previously presented)** The device according to claim 1, wherein the angle formed by brushing directions between themselves is comprised between  $10^{\circ}$  and  $15^{\circ}$ , the optical delay  $\Delta n d = 200 \pm 40$  nm, and for a levo-rotatory

liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-55^{\circ}; -35^{\circ}] \cup [35^{\circ}; 55^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-45^{\circ}; -25^{\circ}] \cup [45^{\circ}; 70^{\circ}]$ .

**12. (previously presented)** The device according to claim 1, wherein the angle formed by brushing directions between themselves is comprised between  $10^{\circ}$  and  $15^{\circ}$ , the optical delay  $\Delta n d = 200 \pm 40$  nm, and for a dextro-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-35^{\circ}; -55^{\circ}] \cup [35^{\circ}; 55^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-70^{\circ}; -45^{\circ}] \cup [25^{\circ}; 45^{\circ}]$ .

**13. (previously presented)** The device according to claim 1, wherein the angle formed by brushing directions between themselves is comprised between  $0^{\circ}$  and  $10^{\circ}$ , the optical delay  $\Delta n d = 200 \pm 40$  nm, and for a levo-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-65^{\circ}; -40^{\circ}] \cup [25^{\circ}; 50^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-55^{\circ}; -25^{\circ}] \cup [35^{\circ}; 65^{\circ}]$ .

**14. (previously presented)** The device according to claim 1, wherein the angle formed by the brushing directions between themselves is comprised between  $0^{\circ}$  and  $10^{\circ}$ , the optical delay  $\Delta n d = 200 \pm 40$  nm, and for a dextro-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-50^{\circ}; -25^{\circ}] \cup [40^{\circ}; 65^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-65^{\circ}; -35^{\circ}] \cup [25^{\circ}; 55^{\circ}]$ .

**15. (previously presented)** The device according to claim 1, wherein the angle formed by brushing directions between themselves is comprised between  $0^{\circ}$  and  $5^{\circ}$ , the optical delay  $\Delta n d = 280 \pm 40$  nm, and for a levo-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-70^{\circ}; -45^{\circ}] \cup [20^{\circ}; 45^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-50^{\circ}; -25^{\circ}] \cup [40^{\circ}; 65^{\circ}]$ .

**16. (previously presented)** The device according to claim 1, wherein the angle formed by brushing directions between themselves is comprised between  $0^{\circ}$  and  $5^{\circ}$ , the optical delay  $\Delta n d = 280 \pm 40$  nm, and for a dextro-rotatory liquid

crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-45^{\circ}; -20^{\circ}] \cup [45^{\circ}; 70^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-65^{\circ}; -40^{\circ}] \cup [25^{\circ}; 50^{\circ}]$ .

**17. (previously presented)** The device according to claim 1, wherein the ratio between the thickness  $d$  of the cell and the spontaneous pitch  $p_0$ , of the liquid crystal molecules, is approximately equal to  $0.25 \pm 0.1$  or  $0.25 \pm 0.05$ .

**18. (previously presented)** A method for the optimization of the orientation of two polarizers (10, 40) in a nematic liquid crystal display device presenting two stable states, without an electric field, that are obtained by anchoring break, the two stable states corresponding to two textures of liquid crystal molecules, the twisting of which differs by  $150^{\circ}$  to  $180^{\circ}$  in absolute values, said method comprises the steps consisting of calculating the rotatory power of the cell and positioning the two polarizers (10, 40), the first polarizer(10) being placed on the side of the observer, the other polarizer (40) being placed on the opposite face of the liquid crystal cell, according to an orientation shifted by a value equal to the rotatory power of

the cell  $\pm \pi/2$ , the rotatory power corresponding to the effect of the most twisted texture.

**19. (previously presented)** The method according to claim 18, wherein the rotatory power PR is calculated on the basis of the relationship:

$$PR \cong \phi - \arctg\left(\frac{\phi}{X} \operatorname{tg} X\right) \quad [3]$$

$$\text{with } X(\phi, \lambda) = \sqrt{\phi^2 + \left(\frac{\pi \Delta n d}{\lambda}\right)^2} \quad [2].$$

**20. (previously presented)** The method according to claim 18, which comprises the steps consisting of:

- calculating the rotatory power PR using a formula which utilizes the optical delay  $\Delta n d$ , the twist  $\Phi$  and the wavelength  $\lambda$ ,

- fixing the orientation A of the output polarizer (10) equal to  $P + PR \pm \pi/2$ , P representing the orientation of the polarizer (40) on the side opposite to the observer and PR the rotatory power,

- researching the values of P which produce the highest resultant transmission value for a twist value equal to  $\Phi \pm \pi$  in the case of infinite azimuthal anchoring or a twist value equal to  $\Phi \pm \pi - 2\pi$  taking account of the elastic uncoupling, and

- deducing A from it.

**21. (previously presented)** The method according to claim 18, wherein the transmission value is defined by the relationship:

$$Tas(\phi, \lambda) = \cos^2(\alpha + \beta) - \cos^2 X \cos 2\alpha \cos 2\beta \left[ \frac{\phi}{X} \tan X - \tan 2\alpha \right] \left[ \frac{\phi}{X} \tan X + \tan 2\beta \right]$$

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**22. (previously presented)** The method according to claim 18, wherein the rotatory power PR is calculated on the basis of an optimal twist value  $\phi_{opt}$  determined on the basis of the relationship:

$$\phi_{opt} = \pi \sqrt{1 - \left( \frac{\Delta n d}{\lambda_0} \right)^2} \quad [6].$$

**23. (previously presented)** The method according to claim 18, wherein the rotatory power PR is calculated on the basis of a twist value imposed by the azimuthal anchoring.

**24. (previously presented)** The method according to claim 18, which comprises a step of adaptation of the angles of the polarizers in order to improve the colorimetric neutrality of the white obtained.

**25. (previously presented)** The method according to claim 18, wherein the rotatory power PR is calculated on the basis of a twist value which integrates an uncoupling (DE) resulting from a finite azimuthal anchoring.

**26. (previously presented)** The device according to claim 11, wherein the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-40^{\circ}; -50^{\circ}] \cup [40^{\circ}; 50^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-45^{\circ}; -25^{\circ}] \cup [50^{\circ}; 65^{\circ}]$ .

**27. (previously presented)** The device according to claim 12, wherein for the dextro-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-40^{\circ}; -50^{\circ}] \cup [40^{\circ}; 50^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-65^{\circ}; -50^{\circ}] \cup [25^{\circ}; 45^{\circ}]$ .

**28. (previously presented)** The device according to claim 13, wherein for the levo-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-60^{\circ}; -45^{\circ}] \cup [30^{\circ}; 45^{\circ}]$ , whilst the orientation of the polarizer on the

side of the observer is comprised within the range  $[-50^{\circ}; -30^{\circ}] \cup [40^{\circ}; 60^{\circ}]$ .

**29. (previously presented)** The device according to claim 14, wherein for the dextro-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-45^{\circ}; -30^{\circ}] \cup [45^{\circ}; 60^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-60^{\circ}; -40^{\circ}] \cup [30^{\circ}; 50^{\circ}]$ .

**30. (previously presented)** The device according to claim 15, wherein for the levo-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-65^{\circ}; -50^{\circ}] \cup [25^{\circ}; 40^{\circ}]$ , whilst the orientation of the polarizer on the side of the observer is comprised within the range  $[-45^{\circ}; -30^{\circ}] \cup [45^{\circ}; 60^{\circ}]$ .

**31. (previously presented)** The device according to claim 16, wherein for the dextro-rotatory liquid crystal, the orientation of the polarizer on the opposite side with respect to the observer is comprised within the range  $[-40^{\circ}; -25^{\circ}] \cup [50^{\circ}; 65^{\circ}]$ , whilst the orientation of the polarizer on the

side of the observer is comprised within the range  $[-60^\circ; -45^\circ] \cup [30^\circ; 45^\circ]$ .